

# Recent research activities of relevance for SilvaCarbon

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January 23, 2023

Research funded by NASA (CMS, LCLUC, SERVIR, MEaSUREs); SilvaCarbon; USGS LST

**Research team**

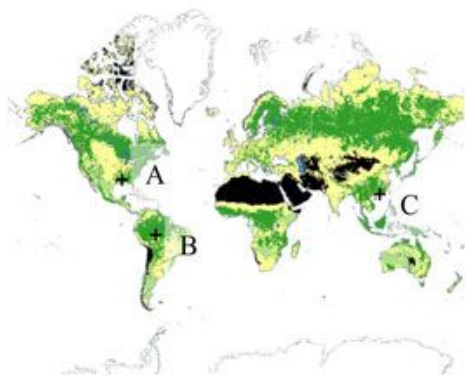
Paulo Arevalo	Boston University
Eric Bullock	US Forest Service
Shijuan Chen	Yale University
Pontus Olofsson	NASA
Xiaojing Tang	James Madison University
Katelyn Tarrio	Boston University
Curtis Woodcock	Boston University

# Research topics of relevance

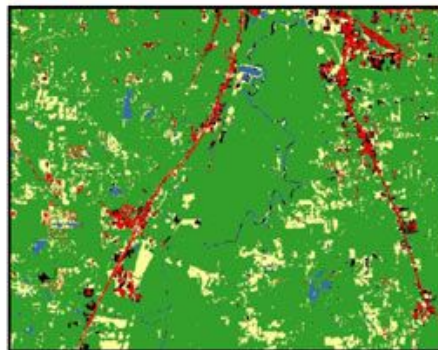
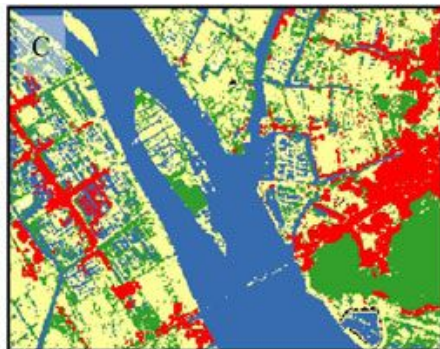
- Time series analysis
  - Land-cover change
  - Forest degradation
  - Plantations (Katelyn Tarrio)
- Sampling techniques
- Near real-time

# NASA MEaSUREs 2018-2023: A Data Record of 21st Century Global Land Cover/Use/Change (“GLaNCE”)

Graphics from [Friedl et al. \(2022\)](#); data hosted by [LP DAAC](#)



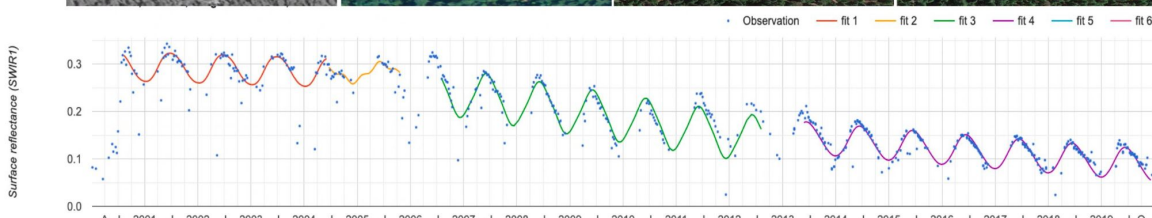
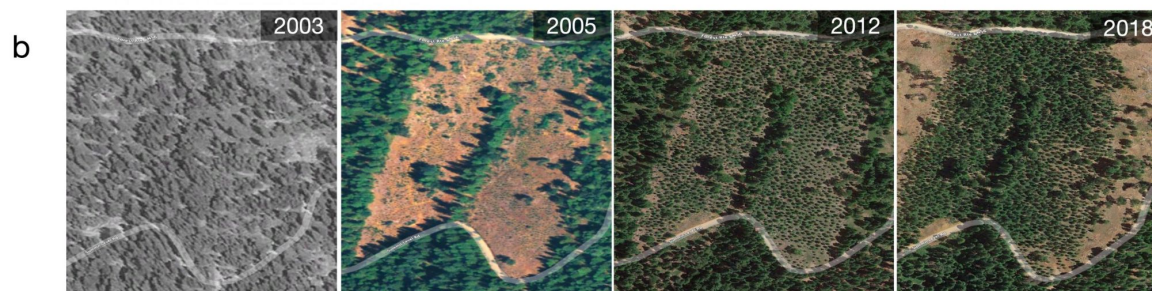
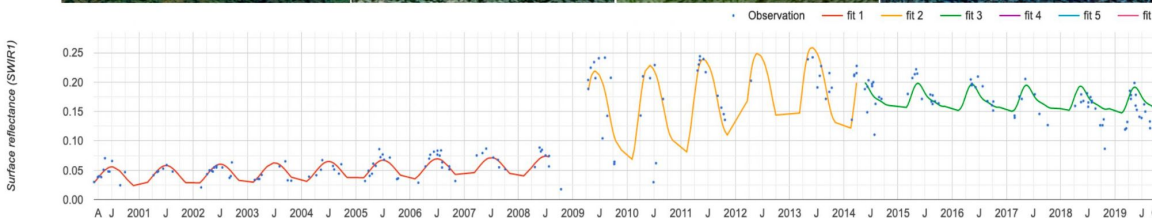
## Legend



0 5 10 15 km

0 5 10 15 km

0 1 2 3 km



GLanCE: CCDC with training data on Google Earth Engine

<https://sites.bu.edu/measures>

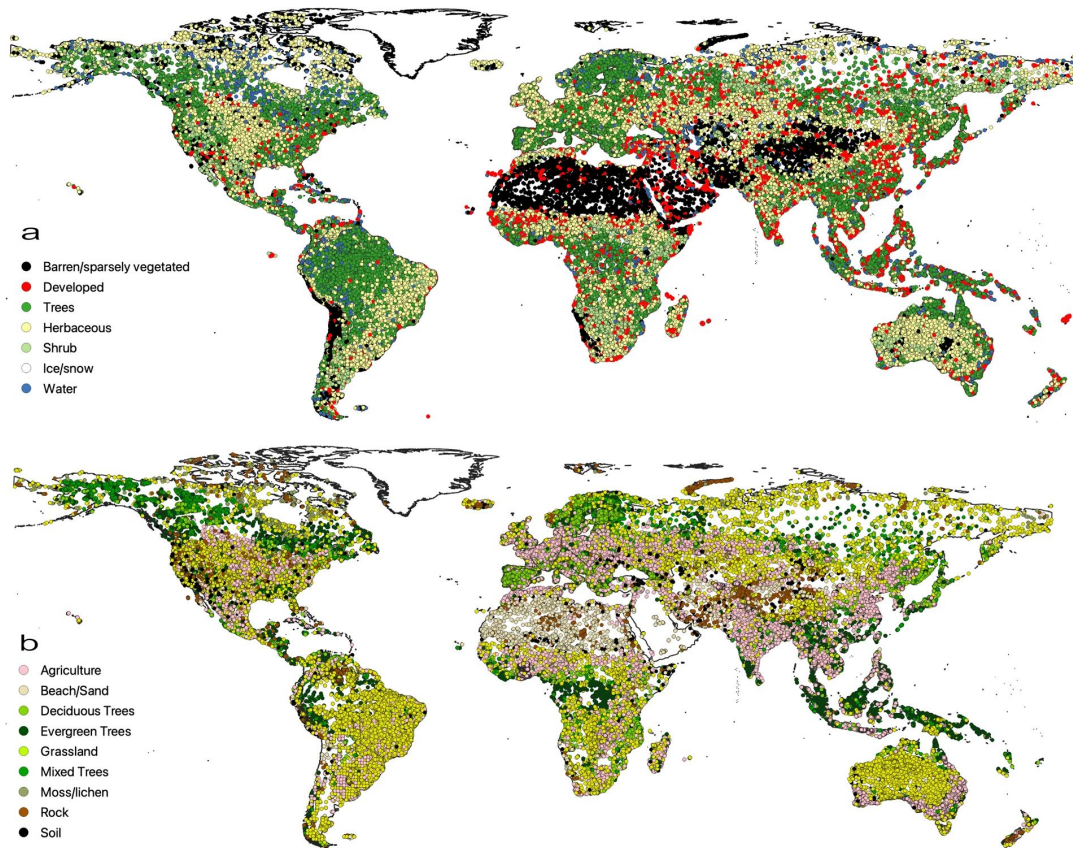


# Global training dataset just published ( $n = 2\text{M}$ )

Stanimirova et al. (2023). A global land cover training dataset from 1984 to 2020.

*Scientific Data* 10, 879.

<https://www.nature.com/articles/s41597-023-02798-5>



Zambia, example: REDD+ implementation team made dataset of activity data by applying CCDC on GEE using different training datasets. Efforts focused on the iterations of algorithm execution and training data refinement. *Could now be done with GLanCE data.*

**CCD TS controls**

Select band **Time series controls** SWIR1

Start date 1999-01-01

End date 2020-06-01

**Visualization params**

Chart type **Image controls** Time series

SWIR1 0 0.6

NIR 0 0.6

RED 0 0.6

**Map Feedback**

Draw Geometry

MAP

REFERENCE

Year

Enter notes...

Save Feedback

**Misc options**

Lat 0

Lon 0

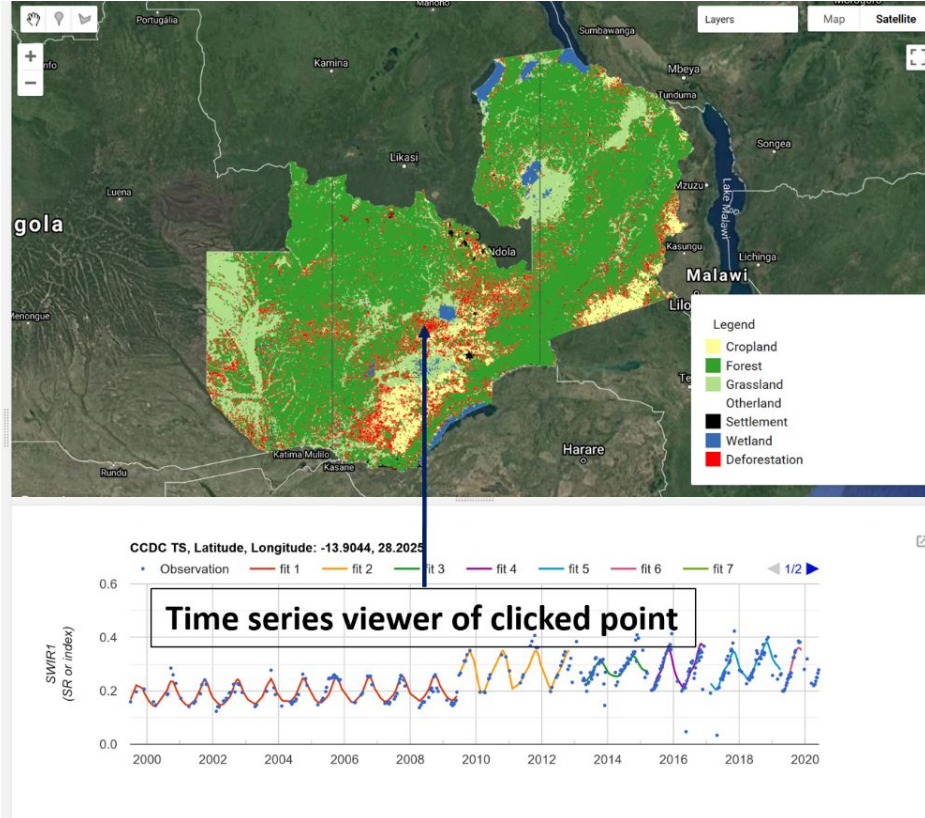
Go!

Generate KML Link

Download KML

**Feedback tools**

**Zoom to coordinates**



**Make Landcover Maps (BETA)**

Results path users/bullocke/zambia/2021/classifica

Image or Folder? Image

Load

**Land Cover Bands**

Land Cover Dates (YYYY-MM-DD); Comma separated 2003-01-01, 2017-01-01

**Change band (optional)**

Date (From) 2001-01-01 Date (To) 2018-01-01

Class (From) 2 Class (To) 1,3,4,5,6

**Visualization Parameters (Optional)**

Map Classes (String) Cropland, Forest, Grassland, Otherland, s

Palette #ffff99, #33a02c, #b2df8a, white, black,

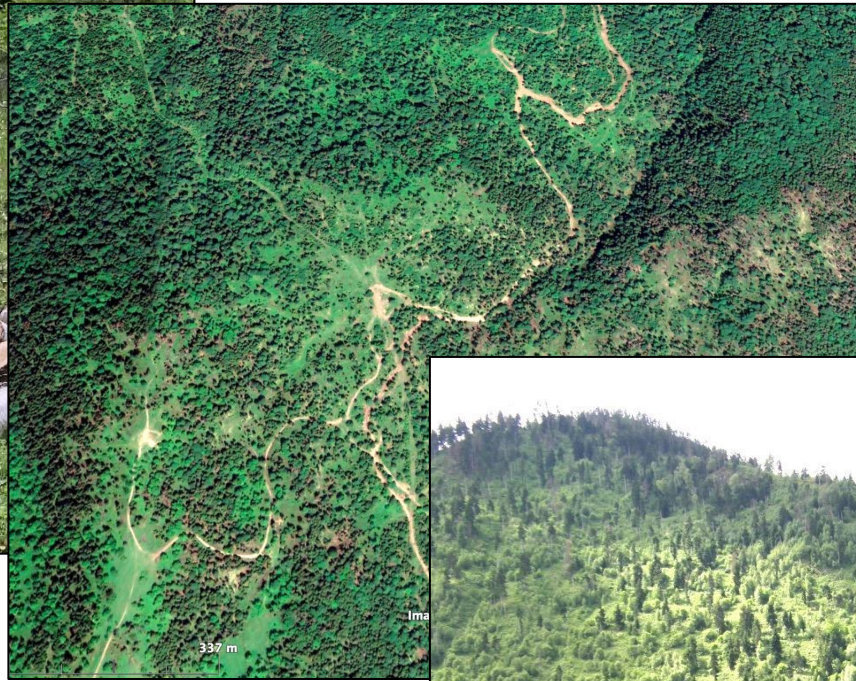
Change Class Name Deforestation

Change Class Color red

Run

**Map layer controls**

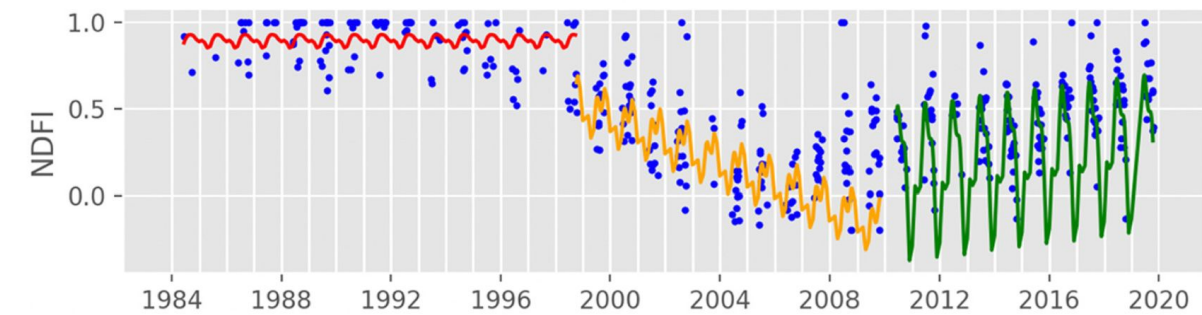
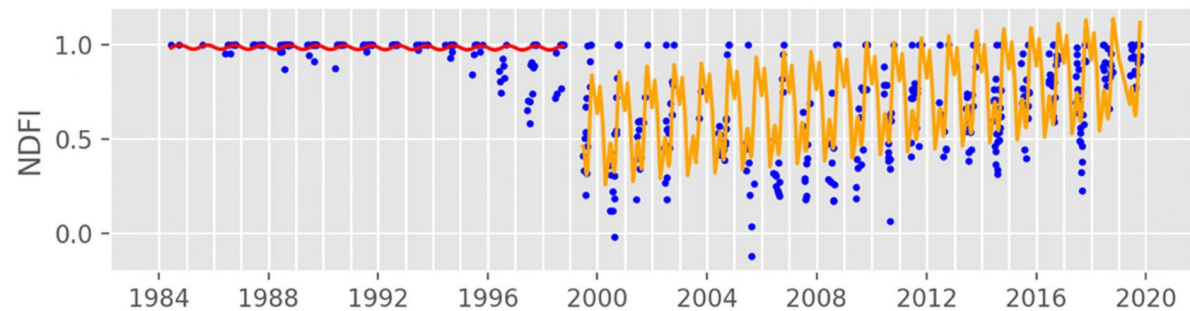
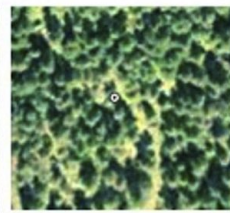
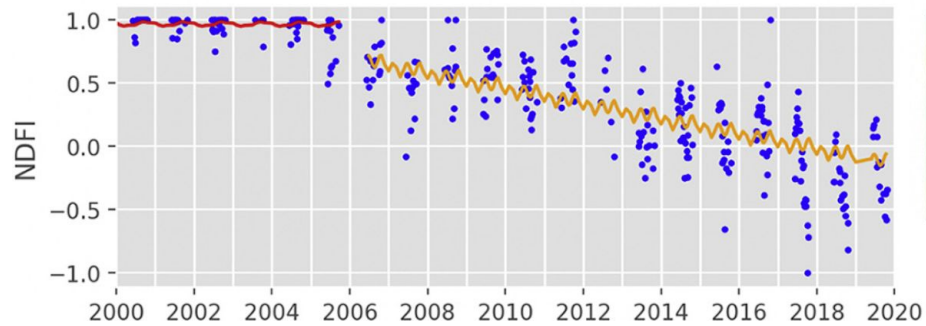




## Example of forest degradation, the Caucasus

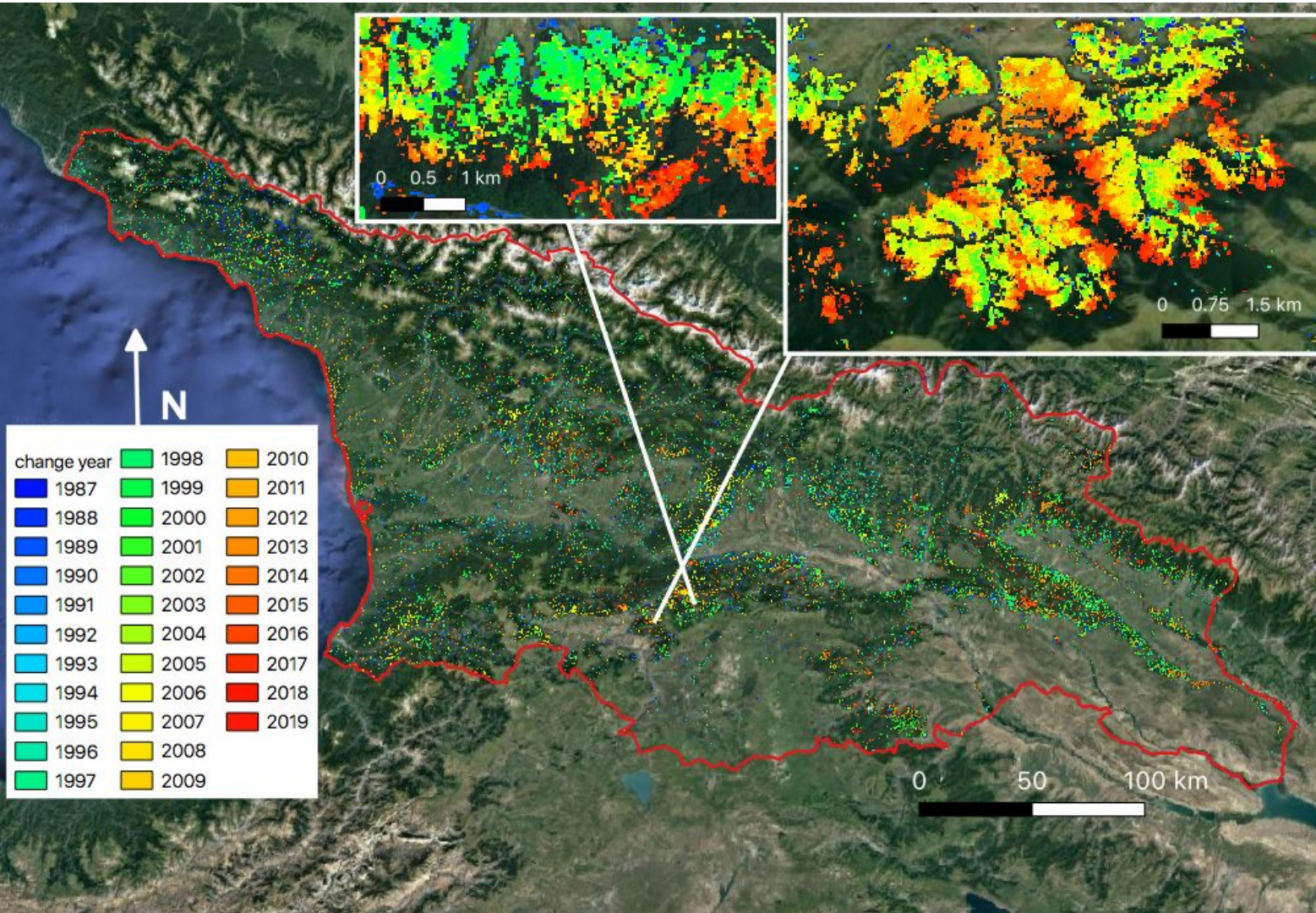
Chen, S., Woodcock, C. E., Bullock, E. L., Arévalo, P., Torchinava, P., Peng, S., & Olofsson, P. (2021). Monitoring temperate forest degradation on Google Earth Engine using Landsat time series analysis. *Remote Sensing of Environment*, 265, 112648.



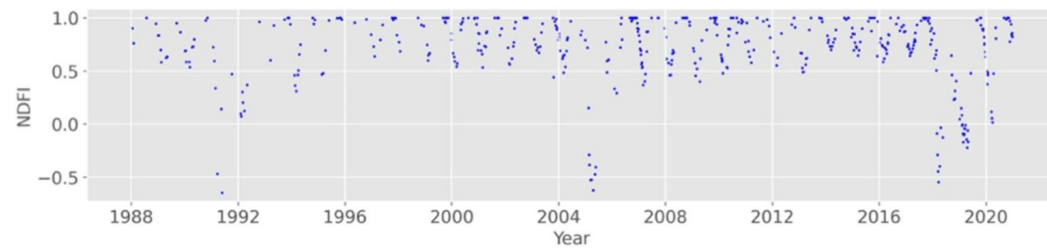


Chen et al. (2022), Remote Sensing of Environment

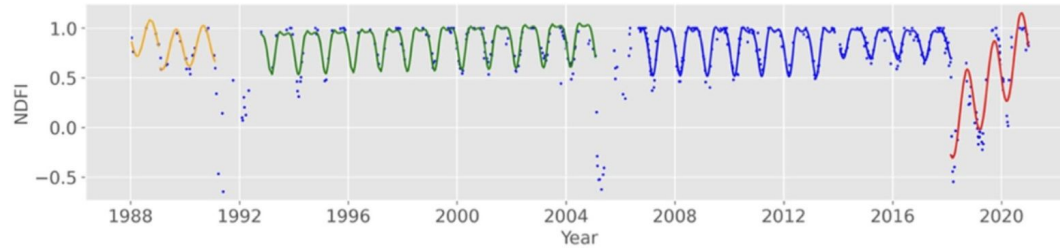




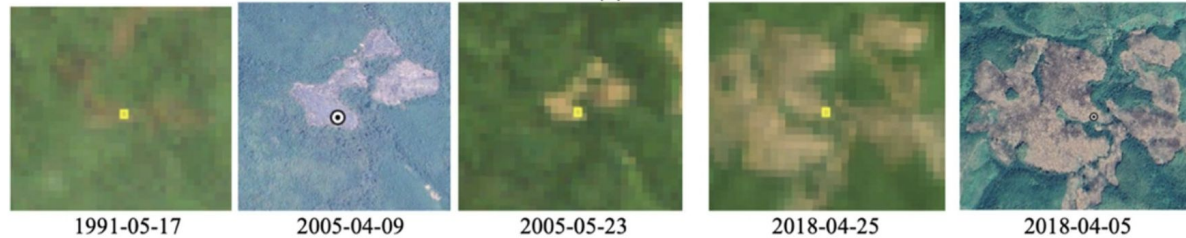
Chen et al.  
(2022),  
*Remote  
Sensing of  
Environment*



(a)



(b)



(c)

## Monitoring shifting cultivation and tracking carbon dynamics

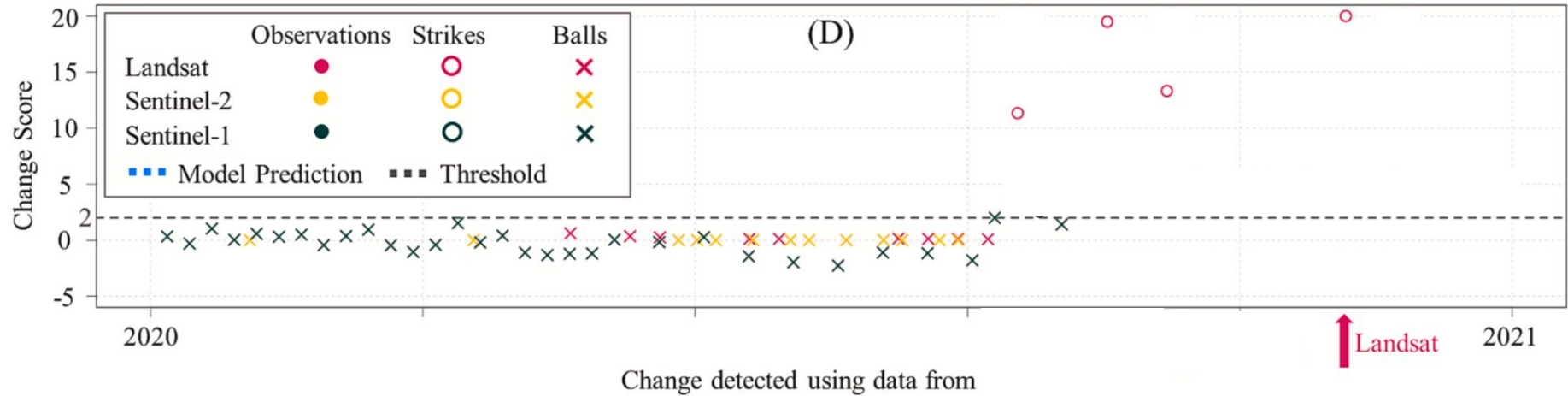
Chen, S., Woodcock, C. E., Saphangthong, T., & Olofsson, P. (2023). Satellite data reveals a recent increase in shifting cultivation and associated carbon emissions in Laos. *Environmental Research Letters*, 18(11), 114012.

**Figure 1.** An example of active shifting cultivation in previously cultivated land (location:  $20^{\circ} 7' 13''$ N,  $101^{\circ} 6' 59''$  E). The shifting cultivation events in 2005 and 2018 were categorized as *Previous Shifting Cultivation* because shifting cultivation first occurred in 1991. This place is also *Active Shifting Cultivation* because the latest shifting cultivation event occurred in 2018. (a) Landsat time series. (b) CCDC-SMA model fits. Different colors show different segments and the model breaks in 1991, 2005, and 2018 show slash and burn events. The colored lines show the seasonality of the forest and the drops between lines show slash-and-burn events. (c) Landsat images and high-resolution images on Google Earth. In the Landsat images (red–green–blue), the yellow squares show the pixel location. In the high-resolution image, the white point shows the pixel location.





# Near real-time monitoring of forest monitoring



Tang, X., Bratley, K. H., Cho, K., Bullock, E. L., Olofsson, P., & Woodcock, C. E. (2023). Near real-time monitoring of tropical forest disturbance by fusion of Landsat, Sentinel-2, and Sentinel-1 data. *Remote Sensing of Environment*, 294, 113626.